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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,732	01/06/2006	Manfred State	810.1144	6742
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Davidson, Davidson & Kappel, LLC			EXAMINER	
485 7th Avenue			SIDDIQUEE, MUHAMMAD S	
14th Floor				
New York, NY 10018			ART UNIT	PAPER NUMBER
			1795	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/538,732

**Applicant(s)**

STUTE ET AL.

**Examiner**

MUHAMMAD SIDDIQUEE

**Art Unit**

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**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 15-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 15-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-85/86)
- Paper No(s)/Mail Date 6/13/2005, 1/6/2006
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Inventor's Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

1. Claim 20 is objected to because of the following informalities: Claim 20 recites "*compressor* ratio". Appropriate correction is required.
2. Claim 22 is objected to because of the following informalities: Claim 22 recites "expander include *and* expander pumping chamber". Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
  1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any

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inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 15-19 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benz et al (5,645,950) in view of Keefer et al (US 6,056,804).

Regarding claims 15-19, Benz discloses a device for providing air to a fuel cell (12) with a compressor (6) connected upstream of the fuel cell and an expander (16) connected downstream of the fuel cell. The compressor and expander are on a shaft. The device is preferably equipped with an inner-shaft rotary piston engine. The compressor and expander are integrated in a housing. The expander and compressor are based on the positive displacement principle. The compressor is based on the volumetric pump principle with internal compression (reaction of the rotational swept volume during a revolution). The expander operates according to the constant volume principle [ Fig. 1; column 2, lines 7-60]. Benz fails to teach that the compressor and the expander are claw type. However, claw type pumps and compressor are known to be used with fuel cell system. Keefer discloses a pressure swing adsorption (PSA) equipment for oxygen enrichment and hydrogen purification in fuel cells. The PSA comprises a claw pump (25) (claw compressor) having rotors (26, 27) (first and second wheels), claws (28, 29) (first and second claws) and shafts (31, 32) (first and

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second shafts); an exhaust claw pump (45) (claw expander) having rotors (46, 47) (first and second wheels), claws (48, 49) (first and second claws) and shafts (51, 52) (first and second shafts). The shafts are mounted with timing gears (33, 53) (synchronizing gear) and rotates in the same direction in a mirror-inverted configuration [Fig. 1; column 9, lines 26-59, column 15, lines 1-26]. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to utilize the teachings of claw type compressor and expander as taught by Keefer in the fuel cell system of Benz in order to achieve high energy efficiency in a very compact fuel cell system.

Regarding claims 22-23, Keefer teaches that claw pump (25) (claw compressor) includes a pumping chamber (24) and the claw pump (45) (claw expander) includes a pumping chamber (60) [Fig. 1]. Keefer remains silent about the size of the chambers. However, it is a design choice and depends on the size of wheel of the compressor/expander. If the expander wheels are smaller, the pumping chamber becomes smaller and it is within the technical grasp of a skilled artisan to size compressor/expander pumping chambers to the desired value.

7. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benz et al (5,645,950) in view of Keefer et al (US 6,056,804) as applied in claim 15 and further in view of Duncan (US 2002/0179036 A1).

Regarding claims 20-21, Benz/Keefer remains silent about adjustable compression ratio. Compression ratio for compressor or expansion ratio for an expander is an inherent feature. Duncan discloses a compressor where it is

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taught that compression ratio is adjustable [paragraph 0022]. Therefore, it would have been obvious to a person of ordinary skilled in the art at the time the invention was made to utilize the teachings of adjustable compression ratio as taught by Duncan in the fuel cell system of Benz/Keefer in order to achieve a desired output.

8. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benz et al (5,645,950) in view of Keefer et al (US 6,056,804) as applied in claim 18 and further in view of Houser et al (US 6,289,692 B1) and Clarke et al (US 2003/0019237 A1).

Regarding claims 24-26, Benz/Keefer remains silent about expansion cooling of the compressor and expander though Keefer teaches recovering the expansion energy and use it for cooling [column 14, lines 56-62]. Recovering expansion energy and using that for cooling is known in the art. Houser teaches using expansion cooling for compressor [column 9, lines 3-7]. Clarke teaches expansion cooling and recycling of gas stream [paragraph 0012]. Arrangement of apparatus for easy and compact packaging is within the technical grasp of a skilled artisan. Therefore, it would have been obvious to a person of ordinary skilled in the art at the time the invention was made to utilize the teachings of expansion cooling and recycling streams as taught by Houser and Clarke in the fuel cell system of Benz/Keefer in order to achieve efficient operation.

9. Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benz et al (5,645,950) in view of Keefer et al (US 6,056,804), Houser et al

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(US 6,289,692 B1) and Clarke et al (US 2003/0019237 A1) as applied in claim 24 and further in view of Yokoi et al (US 3,236,213).

Regarding claims 27-28, Benz/Keefer/Houser/Clarke remains silent about a common double wall housing of the device. However, Yokoi discloses a device comprising first rotary machine (internal combustion engine) and a second rotary machine (compressor) arranged in a common housing of double walls [Fig. 1-2; claims 1-3]. Therefore, it would have been obvious to a person of ordinary skilled in the art at the time the invention was made to utilize the teachings of using common double walled housing as taught by Yokoi in the fuel cell system of Benz/Keefer/Houser/Clarke in order to achieve efficient cooling of the device and compact size.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MUHAMMAD SIDDIQUEE whose telephone number is (571) 270-3719. The examiner can normally be reached on Monday-Thursday, 7:30 am to 4:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MSS

/PATRICK RYAN/  
Supervisory Patent Examiner, Art Unit 1795